Mycoscience 36: 271–275, 1995

Additions to the genus *Xenidiocercus* (coelomycetes) from Ghana

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Accepted for publication 24 June 1995

Two new species of the coelomycete genus *Xenidiocercus* are described and illustrated, *X. macrospora* on leaves of *Macaranga rowlandii* and *X. pyriformis* on leaves of *M. huraefolia*. They differ from the type species in having wider and ellipsoidal or pyriform conidia. A key to species of *Xenidiocercus* and *Idiocercus* is provided.

Key Words——Ghana; *Idiocercus*; *Macaranga*; *Xenidiocercus*.

The genus *Idiocercus* Sutton was erected by Sutton (1967), with two species, the type of the genus, *I. pirozynskii* Sutton on *Harungana madagascariensis* Pior., and *I. macarangae* (T. S. Ramakr.) Sutton (syn. *Macrophoma macarangae* T. S. Ramakr.) on *Macaranga* sp. Characters of the genus at that time included punctiform, unilocular, pycnidial conidiomata, percurrently proliferating conidiogenous cells and hyaline, aseptate conidia each with an elongated basal frill or appendage which was interpreted as the remnant of the conidiogenous cell. A third species, *I. australis* (Cooke) Swart on *Eucalyptus* sp., was added by Swart (1988).

In his extensive treatment of coelomycetes with appendaged conidia, Nag Raj (1993) divided the genus, maintaining *Idiocercus* for one species, *I. pirozynskii*, and separating *I. macarangae* as the type of a new genus, *Xenidiocercus* Nag Raj. He excluded *I. australis* from *Idiocercus* but did not suggest an alternative placement for it. The reasons for making these decisions basically concern the differences between *I. pirozynskii* and *I. macarangae* in morphology of conidiomata and conidia, and in some details of conidiogenesis. Based on an examination of type collections Nag Raj stated "Conidiomata of *I. pirozynskii* produce both macroconidia and microconidia; the dark tissue around the ostiolar channel is composed of brown, thickened cells; regeneration of conidiogenous cells is absent; unicellular, colourless, macroconidia are formed inside a thin-walled sheath that often extends at either end into an appendage (type F) and undergoes progressive gelatinization. In contrast, the conidiomata of *I. macarangae* produce only one type of conidium; the dark tissue around the ostiolar channel is made up of two different elements: thick-walled, dark brown cells of the outer textura globulosa and thick-walled, darkened cells resembling conidiogenous cells which have lost their ability to produce conidia; regeneration of conidiogenous cells is by percurrent growth through old effete conidiogenous cells, the wall of which becomes progressively gelatinized as in some species of *Coniella*; the conidia are composed of a conidium body and a basal appendage of type A2. .... Because of the differences between *I. pirozynskii* and *I. macarangae*, a sensu stricto concept for *Idiocercus* is warranted. I have introduced the new anamorph-genus name *Xenidiocercus* to accommodate *I. macarangae*."

An alternative point of view is that these characters might be comparatively minor and insufficient justification for introducing another generic name in this group of fungi. Microconidial states are not infrequent in coelomycetes (Sutton, 1980; Nag Raj, 1993) and their presence or absence in any single genus is not of great importance in defining that genus. Conidiomatal structure is a notoriously variable taxonomic criterion, especially for taxa described from culture, the tissue composition, thickness, pigmentation etc. often being affected by the substratum and its physical nature. It is possible that the conidiomatal wall structure around the ostiole in these species could be influenced by host-pathogen interactions and the environment during development. A re-examination of the relevant type material of *I. pirozynskii* and *I. macarangae* showed nothing more than minor variations in wall structure around the ostiole. Both species form conidiogenous cells which proliferate percurrently to form a succession of conidia seceding at progressively higher levels, but in *I. macarangae* there is a mucilaginous sheath around the conidiogenous cells which persists as degenerated material after conidial formation. In *I. pirozynskii* however there is no such material. This leaves the main distinction between the two species dependent on conidial morphology. Nag Raj (1993) described conidia in *I. pirozynskii* as enclosed in a thin membranous sheath. This is actually the outer wall of the conidium because it is involved in conidium secession. At the apex this wall extends out into an apical conical appendage. These features invite comparison with a similar type of morphology and development seen in the complex of genera which includes *Kellermania* Ell. & Everh., *Alpakesa* Subraman. & T. Ramakr. (considered a

synonym of *Kellermania* by Nag Raj, 1993) and *Piptarthron* Mont. ex Höhn. Indeed with the broad generic interpretation of *Kellermania* adopted by Nag Raj (1993) the justification for including septate and aseptate species with either single or multiple tentacular appendages in the same genus could readily be invoked for also including *I. pirozynskii* in *Kellermania*. This would have the effect of putting *Idiocercus* as a generic synonym of *Kellermania*, a step which at the moment is premature and should better await a generic reappraisal of this particular group of species. By comparison, the mucilage surrounding the conidiogenous cells in *I. macarangae* does not persist as a conidial sheath or appendage at maturity. It is for these reasons that the genus *Xenidiocercus* is accepted as distinct from *Idiocercus*.

Teleomorphic relationships might eventually be of help in resolving generic concepts in this group but the complexities of ascomycete relationships in the genera concerned preclude any resolution of the problem at the moment. No ascomycetes have been reliably linked with *Idiocercus* or *Xenidiocercus* species. The correlations that have been suggested are mostly circumstantial as 1.2.1 or 1.2.2, or experimental as 1.3.2 (Kendrick and DiCosmo, 1979). These fungi appear to be biotrophs, certainly for the initial phases of their existence in plant tissues, and there is only one report of species having been grown in culture (Yip in Swart, 1988). A possible teleomorphic state of *I. australis*, named as *Clypeophysalospora latitans* (Sacc.) Swart (Amphisphaeriaceae), has been found growing in close association with it on leaf material of *Eucalyptus* by Swart (1988). He reported that other collections of fungi similar to *Idiocercus* species occurred on *Eucalyptus, Dianella* and *Alyxia*, and material on the latter two host substrata were also intimately associated with an ascomycete state. Swart (1988) thought that these ascomycetes belonged to *Botryosphaeria* Ces. & De Not. (Botryosphaeriaceae) rather than *Clypeophysalospora*. The type collection of *I. pirozynskii* also bears a few poorly developed ascomata of a species which is *Botryosphaeria*-like. A further complication is the presence of another complex of species with associations between *Polystigma* DC. (Phyllachoraceae) and *Idiocercus*-like anamorphs on *Acacia* in Australia (Sutton and Pascoe, unpubl.; John Walker, unpubl.) but Hyde and Cannon (1992) indicate that these ascomycetes will probably be separated from *Polystigma* in future revisions.

Key to species of *Xenidiocercus* and *Idiocercus*

1. Conidia exceeding 20 μm in length 2
1. Conidia less than 20 μm in length 3
   2. Conidia 19-29 × 5-7 μm, apex obtuse, basal appendage lacking; on *Eucalyptus* sp. ..... *I. australis*
   2. Conidia 31.5-46 × 8.5-12 μm, apex conic, basal appendage lacking; on *Harungana madagascariensis* ..... *I. pirozynskii*
3. Conidia 15-18.5 × 5-6 μm, clavate to ellipsoidal, basal appendage 2-7.5 μm long; on *Macaranga* sp. ..... *X. macarangae*
3. Conidia 7.5-10 μm wide 4
   4. Conidia 12.5-16 × 7.5-8.5 μm, pyriform to ellipsoidal, basal appendage 3-10 μm long ..... *X. pyriformis*
   4. Conidia 15-18.5 × 8-10 μm, ellipsoidal, basal frill up to 2 μm long ..... *X. macrospora*

Xenidiocercus pyriformis Wu & Sutton, sp. nov. Fig. 1

In follis vivis. Laesiones irregulares, luteo brunneae vel brunneae cum margine lutea vel pallide brunnea diffusa versus contextum viridem, singulae vel confluentes, usque ad 3 mm diam. Conidiomata epigena, pycnidialia, immersa, subepidermalia, dispersa vel raro aggregata, 1-5 in laesione, nigra, sphaerica, globosa vel subglobosa, unilocularia, 150-300 μm diam; paries 11-17.5 μm crassus, ex textura angulari ex cellulis brunneis vel atro brunneis, crassitunicatibus compositus, stratum externum 1-3 cellulis crassum, stratum interius 3-5 cellulis crassum et ex cellulis pallidioribus, tenuitunicatis, parvioribus. Ostiolum punctiforme, circulare, erumpentes, usque ad 30 μm diam, pariete cingenti usque ad 40 μm crasso et ex cellulis nigris composito. Conidiophora absentia vel una cellula restricta, cylindrica, hyalina, non-ramosa vel raro ad basim ramosa, parietibus tenuitunicatis, laevibus, 10-30 × 5.5-7 μm, in vagino mucilagino persitenti inclusa, ex cellulis interioribus conidiomatum formata. Cellulae conidiogenae discretae vel raro in conidiophoris incorporatae, indeterminatae, cum 1-3 proliferationibus percurrentibus enteroblasticis, lageniformes vel subcylindricae, hyalinae, pariete tenuitunicati, laeve, 10-25 × 5.5-7 μm. Conidia holoblastica, hyalina, aseptata, pyriformia vel ovoidea, ad apicem obtusa, basim truncata, crassitunicata, laevia, guttulata, 12.2-16 × 7.5-8.5 μm, cum appendice hyalina, aseptata, nonramosa, basali 3-10 μm longa.

Holotypus; in foliis vivis *Macarangae huraefoliae* Beille (Euphorbiaceae), Bunsu, Ghana, 7 June 1949, S. J. Hughes 1134, IMI 37156*b*, in International Mycological Institute conservatus.

Biotrophic on living leaves. Lesions irregular in shape, yellow brown to brown with a diffuse yellow to pale brown margin merging gradually into healthy green tissue, single or confluent, up to 3 mm in diam. Conidiomata epigenous, pycnidial, immersed, subepidermial, scattered or more rarely aggregated, 1-5 per lesion, black, spherical, globose to subglobose, unilocular, 150-300 μm in diam; wall 11-17.5 μm thick, of textura angularis composed of brown to dark brown, thick-walled cells, outer layer 1-3 cells thick, inner layer 3-5 cells thick and of paler, thin-walled, small-celled tissue. Ostiole punctiform, circular, erumpent, up to 30 μm in diam, with the surrounding wall up to 40 μm thick and of blackish cells. Conidiophores either absent or restricted to a single basal cell, cylindrical, hyaline, unbranched or rarely branched at the base, wall thin and smooth, 10-30 × 5.5-7 μm, enclosed by a persistent mucilaginous sheath, formed from the inner cells of the conidiomatal wall. Conidiogenous cells discrete or more rarely integrated, indeterminate, with 1-3 percurrent enteroblastic proliferations, lageniform to subcylindrical, hyaline, wall thin and smooth, 10-25 × 5.5-7 μm. Conidia holo-

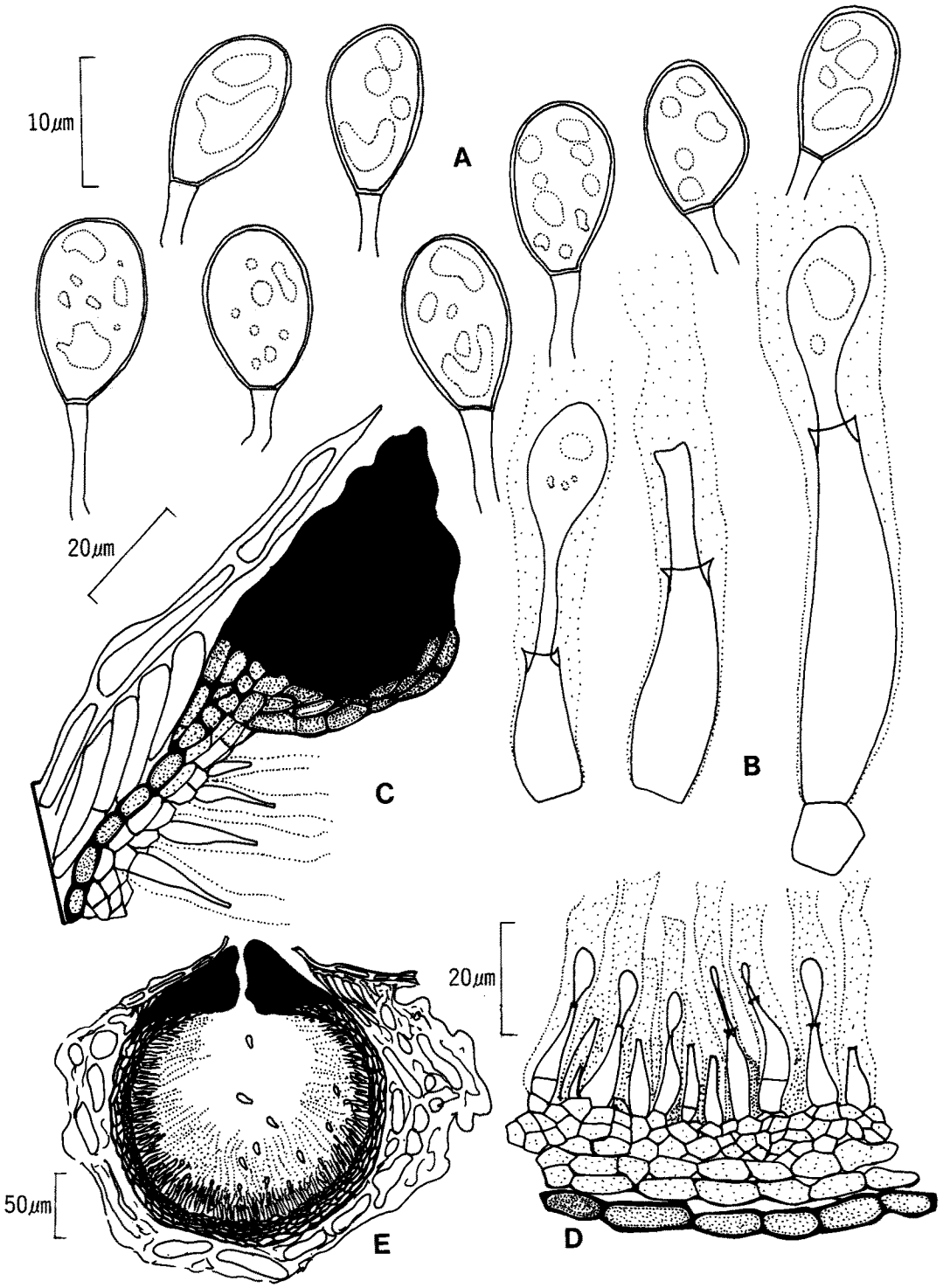

Fig. 1. *Xenidiocercus pyriformis*, IMI 37156b. A. Conidia. B. Conidiophores and conidiogenous cells with persistent sheath. C. Section of conidioma near the ostiole. D. Section of conidiomatal wall with conidiogenous layer. E. Median vertical section of a conidioma.

blastic, hyaline, aseptate, pyriform to ovoid, apex obtuse, base truncate, wall thick and smooth, guttulate, 12.2-16×7.5-8.5 μm, with a hyaline aseptate unbranched basal appendage 3-10 μm long.

Xenidiocercus pyriformis differs from *X. macarangae* (T. S. Ramak.) Nag Raj in having pyriform, wider conidia (7.5-8.5 μm) with a basal appendage 3-10 μm long. In *X. macarangae* they are clavate or ellipsoidal, 5-6 μm wide, though little different in length, and with an appendage 2-7.5 μm long (Fig. 2c). *X. enidiocercus macro-*

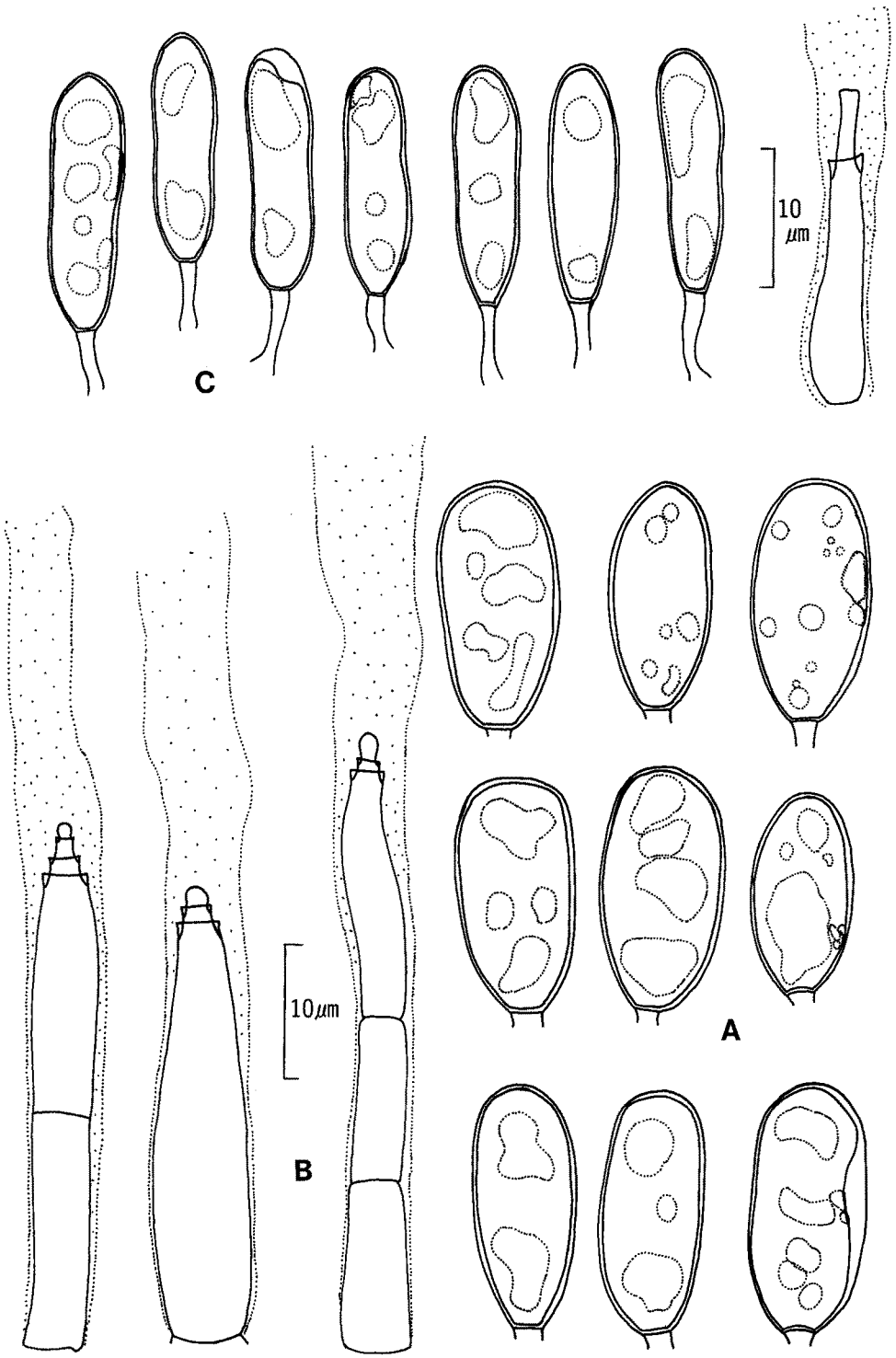

Fig. 2. *Xenidiocercus macrospora*, IMI 39600. A. Conidia. B. Conidiophores and conidiogenous cells. *X. macarangae*, IMI 41330. C. Conidia and a conidiogenous cell.

spora (see below) is similar to *X. pyriformis* in conidial length, but conidia are ellipsoidal and slightly wider (15–17.5 × 8–10 μm) and the appendage is only 2 μm long.

Xenidiocercus macrospora Wu & Sutton, sp. nov.
Fig. 2 A, B

In foliis vivis. Laesiones circulares vel irregulares, luteo brunneae vel atro brunneae cum margine diffusa versus contextum viridem, singulae, 1–2 mm diam. Coni-

diomata epigena, pycnidialia, immersa, subepidermalia, dispersa vel raro aggregata, 1-3 in laesione, nigra, sphaerica, globosa vel subglobosa, unilocularia, 180-350 μm diam; paries 11-17.5 μm crasuss, ex textura angulari ex cellulis pallide brunneis vel brunneis, irregularibus, versus stratum interius hyalinis et parvioribus, 4-7 cellulis crassis, usque ad 20 μm crassis. Ostiolum punctiforme, circulare, erumpentes, usque ad 30 μm diam, pariete cingenti usque ad 40 μm crasso et ex cellulis nigris composito. Conidiophora absentia vel 1-2 septata, cylindrica, hyalina, non-ramosa vel raro ad basim ramosa, parietibus tenuitunicatis, laevibus, 35-45 × 4-7 μm, in vagino mucilagino persitenti inclusa, ex cellulis interioribus conidiomatum formata. Cellulae conidiogenae discretae vel raro in conidiophoris incorporatae, indeterminatae, cum 1-3 proliferationibus percurrentibus enteroblasticis, lageniformes vel cylindricae, hyalinae, pariete tenuitunicati, laeve, 20-30 × 5-8 μm. Conidia holoblastica, hyalina, aseptata, ellipsoidea vel oblonga, guttulata, crassitunicata, laevia, 15-17.5 × 8-9.8 μm, cum appendice hyalina, aseptata, nonramosa, basali 2 μm longa.

Holotypus; in foliis vivis *Macarangae rowlandii* Prain (Euphorbiaceae), Aburi, Ghana, 5 May 1949, S. J. Hughes 417, IMI 39600*a*, in International Mycological Institute conservatus.

Biotrophic on living leaves. Lesions circular to irregular in shape, yellow brown to dark brown with a diffuse margin merging gradually into healthy green tissue, solitary, 1-2 mm in diam. Conidiomata epigenous, pycnidial, immersed, subepidermal, scattered or more rarely aggregated, 1-3 per lesion, black, spherical, globose to subglobose, unilocular, 180-350 μm in diam; wall 11-17.5 μm thick, of textura angularis composed of pale brown to brown, irregular-shaped cells which become hyaline and smaller toward the inner layer, composed of 4-7 layers of cells and up to 20 μm thick. Ostiole punctiform, circular, erumpent, up to 30 μm in diam, with the surrounding wall up to 40 μm thick and of blackish cells. Conidiophores either absent or present and then 1-2 septate, cylindrical, hyaline, unbranched or rarely branched at the base, wall thin and smooth, 35-45 × 4-7 μm, enclosed by a persistent mucilaginous sheath, formed from the inner cells of the conidiomatal wall. Conidiogenous cells discrete or more rarely integrated, indeterminate, with 1-3 percurrent enteroblastic proliferations, lageniform to cylindrical, hyaline, wall thin and smooth, 20-30 × 5-8 μm. Conidia 15-17.5 × 8-9.8 μm, holoblastic, hyaline, aseptate, ellipsoidal to oblong, guttulate, wall thick and smooth, apex rounded, base truncate with a hyaline, unbranched cellular appendage up to 2 μm long.

Xenidiocercus macrospora differs from *X. macarangae* by the oblong to ellipsoidal, wider (8-10 μm) conidia with a shorter appendage only 2 μm long (Fig. 2A). It can also be distinguished from *X. pyriformis* which has pyriform, slightly smaller conidia with a longer appendage (Fig. 1). *Idiocercus australis* (Cook) Swart on *Eucalyptus* sp., has cylindrical to long clavate or elliptical conidia measuring 19-29 × 5-7 μm, with a minute appendage.

Acknowledgement——This work was carried out during the tenure of a Fellowship awarded to Wu Wenping by Novo Nordisk A/S, Denmark.

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